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ABSTRACT

Compared were the effectiveness of individualized instruction in a mainstreamed open classroom setting and instruction in a traditional classroom setting on the achievement levels of 56 low ability students (grades 1-6). Two groups of Ss, paired for grade level and IQ, were tested after 1, 2, and 3 years of exposure to the models. There was no significant difference in academic achievement scores of the two groups; however, the expected corresponsence between IQ and achievement was found. (IM)

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A Comparison of the Achievements of Low Ability Elementary Pupils in Two Models of Instruction

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Introduction

American education is devoted to the basic principles of equal opportunity and social mobility. Those held responsible for developing programs of educational instruction are obligated to provide means and methods of education whereby those pupils with low ability can achieve at maximum levels. This obligation implies that constant attention be given to new methods of instruction which may provide for an increase in achievement for those with low ability for an enhancement of achievement for those with low ability increases their enhances for social mobility.

Individualization may be seen as being of benefit to the low ability pupil. Pupils are permitted to work at their own pace and do not face the anxiety arousing competition from the more able student and the lessons of instructions are designed to minimize failure. It thus seems appropriate to focus attention to the question of the relationship between exposure to an individualized method of instruction and the educational outcome of academic achievement. The basic question which needs to be answered is whether this model of instruction can be shown to be related to higher achievement for low ability pupils. If the methods, concept and materials utilized in an individualized program do lead to higher achievement for the low ability, then wide apread adjustments to a more individualized approach in instructional methods for the low ability should be implemented. With this implied committment to the study of the impact of the individualized approach for the low ability pupil, it therefore seems necessary to conduct the relevant research.

Statement of the Problem

The purpose of this study was to investigate the relationship between exposure

to mainstreamed open-individualized instruction and traditional mainstreamed instruction and for low achievement ability pupils over a three year period of time. That is, do two groups of pupils of low, but equal ability, in two different models of mainstreamed instruction achieve at different levels at the end of one, two, and three years of exposure to these two different forms of instruction.

Null Hypothesis

There will be no difference in achievement when low ability elementary pupils enrolled in an open-individualized school are compared with low ability elementary pupils enrolled in a self-contained traditional school.

Definition of Terms

Open-individualized school - A school using the PLAN individualized approach in an open physical setting. The school described is the Goodview Elementary School in Winona, MN.

Low Ability Pupil - Pupils with intelligence quotient scores ranging from a low of 73 to a high of 91.

Mainstream - A school where all pupils regardless of ability are exposed to the same instruction.

Subjects

The subjects were 28 low ability pupils from Goodview Elementary School - the mainstreamed open-individualized school, and 28 low ability pupils from Madison Elementary School - the mainstreamed self-contained classroom school. Low ability was defined as having an intelligence quotient from a low of 73 to a high of 91 as measured by the SRA Tests of General Ability. The number of pupils at each grade level from each of the two schools was: three pupils from grade one, four pupils from grade two, five pupils from grade three, three pupils from grade four, three pupils from grade five, and ten pupils from grade six.

A listing of the pupils by number, intelligence, and by level of achievement is presented as Appendix A.

Procedures

All pupils in grades one through six in each of the two elementary schools were given the SRA Tests of General ABility in the fall of 1971. The intelligence quotient scores from these tests were used to define the low ability pupils and to provide a basis for the exact matching of the pupils in the two educational models. The fifty-six pupils selected for this study took the SRA Tests of General Ability in 1971 and remained in the original elementary school for the three year period or matriculated into junior high school. A matching procedure was used to equate the two groups of pupils from the two elementary schools. Pupils with similar intelligence quotient scores from the two schools were paired. The closeness of the matching is demonstrated by the fact that the arithmetic mean intelligence quotient scores for the two groups were identical at 84.86.

The criteria used to appraise achievement at the end of each of the first two years of the study were Lee-Clark reading scores for pupils in grades one and two and total scores from the Stanford Achievement Tests for pupils in grades three, four, five and six. In the third year of the study, the test variable used as a criterion of achievement was the Stanford since the first group of pupils had matriculated to the third grade and it was not necessary to use the Lee-Clark measure. Grade point average in junior high school subjects was the criterion for achievement at the end of the second and third years for pupils who matriculated to a common self-contained junior high school following completion of the sixth grade.

Since the numbers at each grade levels were extremely small, it was thus not possible to make comparisons at each grade level. Rather, it was necessary to combine the grade levels into one group for each school and make a comparison between the total two groups. The use of different criteria, at these grade levels

necessitated a conversion of criteria raw scores into a converted score to permit summation of scores at the different grades. Thus, each criterion raw score was converted into a standard score (Z score) and these Z scores were converted into T scores. The statistical formulas for these procedures are:

$$Z = \frac{x - \bar{x}}{s} \quad \text{where}$$

Z = the standard score for a pupil's raw score

x = a pupil's raw score

$\bar{x}$ = the arithmetic mean for the total distribution of achievement scores at that grade for that particular sub-group of pupils.

s = the standard deviation for the total distribution of achievement scores at that grade for that particular sub-group of pupils.

and:

$$T = (z)(10) + 50 \quad \text{where}$$

T = the final converted score for a pupil's raw score

z = the standard score for a pupil's raw score

This conversion of raw scores into T scores permitted the summation of different criterion scores for the various grade levels and thus, a final comparison between the school means at the end of each of the three years of the study. The results of the conversion process for each subject's criterion score for each of the three years can be presented in Appendix A.

The previously described problem was to compare the achievements of low ability elementary pupils in two curricular models. The criteria which will be used are standardized tests and grade point averages. These measures all yield continuous scores and can be considered parametric in nature. Thus, a student's "t" test will be employed to determine if any obtained differences between the two group

means are statistically significant. The formula for computing the critical ratio using this statistical procedure is (Lindequist, 1956):

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{N_1 S_1^2 + N_2 S_2^2}{N_1 + N_2 - 2}\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

where:

$\bar{X}$ = the sample mean

N = the number of subjects in the sample

S = the sample standard deviation

df = $N_1 + N_2 - 2$

The "t" values which will be calculated will be compared with those needed to reach statistical significance from a table of areas under the normal curve. If the "t" values are large enough to reach statistical significance, the null hypothesis will be rejected. If the "t" values are not large enough to reach significance, the null hypothesis will not be rejected.

Results

The means, standard deviations, and corresponding results of the "t" tests of the significance of the differences between the two group means of corrected scores are presented in Table 1. The "t" formulas and arithmetical manipulations are presented as Appendix B.

TABLE 1

Group criterion means, standard deviations, differences between group means, and "t" tests of significance.

	Mean Converted Criterion Score		Standard Deviation		Difference	t
	Open-Indiv.	Self-contain	Open	Self		
1st year	44.2	41.5	7.6	8.4	2.7	*1.27
2nd year	42.6	43.0	9.1	8.0	.4	* .19
3rd year	42.9	40.9	7.7	6.6	2.0	*1.05

*Not significantly different at the .05 level

At the end of the first year (1971-1972) the mean converted score for the low ability pupils in grades one through six in the open-individualized school was 44.2 and the mean converted score for the low ability pupils in grades one through six in the self-contained school was 41.5. The difference of 2.7 between these group means yielded a "t" ratio of 1.27 which was not significant at the .05 level of significance. The spring testing in 1973 yielded a mean converted score of 42.6 for pupils in the open-individualized school and 43.0 for pupils in the self-contained school. The difference of .4 did not reach the significance at the .05 level. Likewise, the difference of 2.0 between the open-individualized mean of 42.9 and the self-contained mean of 40.9 after three years did not reach the .05 level of significance. Thus, the two groups of low ability pupils matched on a measure of intellectual ability and exposed to open-individualized mainstream and self-contained mainstream models of elementary instruction did not differ as an objective measure of achievement when comparisons were made after one, two, and three years of exposure to these models of instruction.

From the T score formula of $T = (z)(10) + 50$, it can be seen that the mean score on a T distribution is 50 with a standard deviation of 10. It can also be noted from Table 1 that the mean achievement scores for both groups at the end of each of the three years was close to one standard deviation below the over-all

grade mean. It should be recalled that T scores were calculated using z scores derived with total group means and standard deviations. Thus, in addition to non-significance differences in achievement appearing between the two groups of low ability pupils in the two models of instruction, lower than average mean achievement scores appeared for these pupils. This latter finding supports the general expectation of a correspondence between measured intelligence and objective measures of achievement. These findings are supportive of the general point of view that achievement results more of ability and related instructional variables rather than from the type of instructional model.

APPENDIX A

Distribution of Intelligence Quotient Scores, Achievement Raw Scores (Lee-Clark Raw Scores for grades one and two, Stanford Achievement Raw Scores for grades three, four and five and Junior High Grade Point Average for grades seven and eight), z scores and corresponding T scores.

Goodview School: Open-Individualized School

Pupil #	Grade	I.Q. Score	Achievement Score			Z Score			T Score		
			1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
1	1	85	22	56	211	-.64	-.531	-.52	43.6	55.3	44.8
2	1	80	35	57	239	.28	.67	-.02	52.8	56.7	49.8
3	1	91	25	51	202	-.43	-.13	-.69	45.7	48.7	43.1
4	2	85	48	201	201	-1.10	-1.35	-1.34	39	36.5	36.6
5	2	89	58	303	350	.47	.74	.66	54.7	42.6	56.6
6	2	89	58	286	313	.47	.39	.16	54.7	46.1	51.6
7	2	89	56	228	239	.16	-.80	-.83	51.6	42	41.7
8	3	89	237	252	210	-.0	-.26	-.32	50	47.4	46.8
9	3	76	219	228	172	-.26	-.50	-.76	47.4	45	42.4
10	3	87	177	167	165	-.85	-1.12	-.84	41.5	38.8	41.6
11	3	88	118	144	150	-1.69	-1.35	-1.02	33.1	36.5	39.8
12	3	74	196	251	200	-.58	-2.80	-.43	44.2	22	45.7
13	4	89	229	184	262	-.50	-1.01	-.46	45	39.9	45.4
14	4	89	302	255	307	.46	.25	.21	54.6	52.5	52.1
15	4	83	243	210	223	-.32	-.55	-1.04	46.8	44.5	39.6
16	5	89	187	207	2.20	-.83	-.96	-1.04	41.7	40.4	46.8
17	5	87	172	166	2.70	-1.01	-1.41	-.32	39.9	35.9	32.3
18	5	85	241	288	2.6	-.20	-.08	-.35	48	49.2	46.5
19	6	73	152	1.95	2.0	-1.97	-1.09	-.92	30.3	39.1	40.8
20	6	81	169	2.18	1.3	-1.75	-.75	-1.83	32.5	42.5	31.7
21	6	88	317	3.25	2.9	.18	.80	.25	51.8	58	52.5
22	6	89	294	2.43	2.56	-.12	-.39	-.19	48.8	46.1	48.1
23	6	84	142	1.53	1.44	-2.10	-1.70	-1.65	29	33	33.5
24	6	76	240	1.93	2.2	-.82	-1.12	-.66	41.8	38.8	43.4
25	6	85	240	1.7	1.78	-.82	-1.45	-1.21	41.8	35.5	37.9
26	6	89	261	1.2	1.2	-.55	-2.17	-1.96	44.5	28.3	30.4
27	6	89	310	3.45	3.44	.10	1.09	.95	51	60.9	59.5
28	6	79	168	1.35	1.3	-1.76	-1.96	-1.83	32.4	30.4	31.7

Appendix A (continued)

Madison School:

Pupil #	Grade	I.Q. Score	Achievement Score			Z Xcore			T Score		
			1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
1	1	85	50	58	254	.12	.32	-.70	51.2	53.2	43
2	1	80	36	51	197	-1.52	-1.94	-1.80	34.8	30.6	32
3	1	90	48	55	259	-.12	-.65	-.60	48.8	43.5	44
4	2	85	59	295	241	.67	.23	.35	56.7	52.3	53.
5	2	89	48	204	163	-1.80	-1.50	-1.81	32	35	31.
6	2	89	56	246	279	.0	-.70	-.40	50	43	46
7	2	90	54	195	224	-.45	-1.68	-1.07	45.5	33.2	39.
8	3	89	274	252	210	-.09	-.26	-.32	49.1	47.4	46.
9	3	76	239	228	172	-.74	-.50	-.76	42.6	45	42.
10	3	87	281	167	165	.04	-1.12	-.84	50.4	38.8	41.
11	3	88	201	144	150	-1.43	-1.35	-1.02	35.7	36.5	39.
12	3	74	190	251	200	-1.64	-2.80	-.43	33.6	22	45.
13	4	87	316	253	348	.23	-.27	.41	52.3	47.3	54.
14	4	85	249	215	296	-.62	-.91	-.38	43.3	40.9	46.
15	4	86	193	197	236	-1.33	-1.23	-1.28	36.7	37.7	37.
16	5	89	189	229	2.20	-1.14	-1.27	-1.04	38.6	37.3	39.
17	5	87	127	181	2.70	-1.89	-1.87	-.32	31.1	31.3	46.
18	5	87	199	251	1.70	-1.02	-1.00	-1.74	39.8	40	32.
19	6	73	138	1.35	1.56	-2.56	-.71	-1.61	24.4	42.9	33.
20	6	81	202	2.25	2.3	-1.66	.32	-.63	33.4	53.2	43.
21	6	88	241	1.8	1.9	-1.11	-.19	-1.16	38.9	48.1	38.
22	6	90	287	1.73	2.2	-.46	-.28	-.76	45.4	47.2	42.
23	6	82	239	1.9	2.19	-1.14	-.08	-.77	38.6	49.2	42.
24	6	77	305	1.7	1.8	-.21	-.31	-1.29	47.9	46.9	37.
25	6	88	262	1.75	1.4	-.82	-.25	-1.83	41.8	47.5	31.
26	6	86	353	3.13	2.89	.46	1.33	.16	54.6	63.3	51.
27	6	84	208	1.4	2.7	-1.57	-.66	-.09	34.4	43.4	49.
28	6	83	168	1.65	1.8	-2.14	-.37	-1.29	28.6	46.3	37.

*Initial grade refers to the grade in which the pupil was enrolled in the fall of 1971.

APPENDIX B

Computational steps for "t" Tests for Significance of Difference between group Mean Converted Achievement Scores.

1972 Data

Open-Individualized	Self-Contained
$N = 28$	$N = 28$
$\bar{X} = 44.22$	$\bar{X} = 41.45$
$S = 7.57$	$S = 8.43$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{N_1 S_1^2 + N_2 S_2^2}{N_1 + N_2 - 2}\right)\left(\frac{N_1 + N_2}{N_1 N_2}\right)}}$$

$$t = \frac{41.45 - 44.22}{\sqrt{\left(\frac{(28)(71.06) + (28)(57.30)}{54}\right)\left(\frac{56}{784}\right)}}$$

$$t = \frac{2.77}{\sqrt{4.75}}$$

$$t = 1.27$$

1973 DATA

Open-Individualized

$N = 28$
$\bar{X} = 42.59$
$S = 9.08$

Self-Contained

$N = 28$
$\bar{X} = 43.03$
$S = 8.03$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{N_1 S_1^2 + N_2 S_2^2}{N_1 + N_2 - 2}\right)\left(\frac{N_1 + N_2}{N_1 N_2}\right)}}$$

$$t = \frac{42.59 - 43.03}{\sqrt{\left(\frac{(28)(64.48) + (28)(82.45)}{54}\right)\left(\frac{56}{784}\right)}}$$

$$t = \frac{.44}{\sqrt{5.44}}$$

$$t = .19$$

1974 DATA

Open-Individualized

$N = 28$
$\bar{X} = 42.9$
$S = 7.67$

Self-Contained

$N = 28$
$\bar{X} = 40.86$
$S = 6.59$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{N_1 S_1^2 + N_2 S_2^2}{N + N - 2}\right)\left(\frac{N_1 + N_2}{N_1 N_2}\right)}}$$

$$t = \frac{40.86 - 42.9}{\sqrt{\left(\frac{(28)(43.43) + (28)(58.83)}{54}\right)\left(\frac{56}{784}\right)}}$$

$$t = \frac{2.04}{\sqrt{3.79}}$$

$$t = 1.05$$

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